



AMENDMENT AND RESPONSE

Serial No. 09/903,273

Title: DYNAMIC BANDWIDTH ALLOCATION

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Attorney Docket No. 100.070US27

AMENDMENTS TO THE SPECIFICATION

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Applicant amends the specification, to tie Figures 27 and 28 to the specification,
as follows:

At page 100, please replace lines 16 – 18 with the following:

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E1

✦ In the initialization process, when the ISU has just been powered up
2710, the ISU 100 has no knowledge of which downstream 6 MHz frequency
band it should be receiving in. ✦

At pages 103 – 104, please replace the paragraph beginning on page 103, line 28 and
ending on page 104, line 5 with the following:

E2

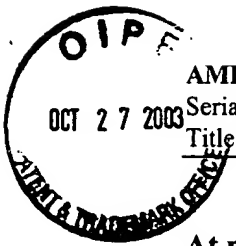
--The HDT is then given information on the new ISU 2712 and provides
downstream commands 2714 for the various parameters to the subscriber ISU
unit. The ISU begins transmission in the upstream 2720 and the HDT 12 locks to
the upstream signal 2730. The HDT 12 derives an error indicator 2732 with
regard to the parameter being adjusted and commands 2734 the subscriber ISU to
adjust such parameter. The adjustment of error is repeated 2736 in the process
until the parameter for ISU transmission is locked to the HDT 12.—

At page 107, please replace the paragraph beginning at line 1 and ending at line 16
with the following:

E3

--After an ISU 100 is initialized and activated for the system, follow-up
synchronization or tracking may be performed periodically to keep the ISUs
calibrated within the required tolerance of the OFDM transport requirements. The
follow-up process is implemented to account for drift of component values with
temperature. If an ISU 100 is inactive for extreme periods of time, the ISU can be
tuned to the synchronization channels and requested to update upstream
synchronization parameters in accordance with the upstream synchronization
process described above. Alternatively, if an ISU has been used recently, the
follow-up synchronization or tracking can proceed over an IOC channel. Under
this scenario, as generally shown in Figure 28, the ISU 100 is requested to provide
a signal over an IOC channel by the HDT 12, 2800. The HDT 12 then acquires
and verifies that the signal is within the tolerance required for a channel within the
OFDM waveform 2811. If not, then the ISU is requested to adjust such errored
parameters 2813. In addition, during long periods of use, ISUs can also be
requested by the HDT 12 to send a signal on an IOC channel or a synchronization
channel for the purpose of updating the upstream synchronization parameters.--

In response to the Examiner's objection to Figures 41-46, Applicant amends the
specification to tie the Figures to the specification as follows:



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At pages 124-126, please replace the paragraphs beginning on page 124, line 29 and ending on page 126, line 18 with the following:

-- Referring to Figures 41, 42, and 43, the basic short integration operation is described. When a parity error 5000 of a channel is detected by the CXMU 56, a parity interrupt is disabled by setting the interrupt priority level above that of the parity interrupt 5001 (Figure 41). If a modem alarm is received which indicates a received signal failure, parity errors will be ignored until the failure condition ends 5002. Thus, some failure conditions will supersede parity error monitoring. Such alarm conditions may include loss of signal, modem failure, and loss of synchronization. If a modem alarm is not active 5004, a parity count table is updated 5006 and an error timer event as shown in Figure 42 is enabled 5008.

E4 When the error timer event is enabled 5100, the channel monitor 296 enters a mode wherein parity error registers of the CXMU 56 are read every 10 milliseconds and error counts are summarized after a one second monitoring period 5105. Generally, the error counts are used to update the channel quality database 5334 and determine which (if any) channels require re-allocation. The channel quality table 300 of the database contains an ongoing record of each channel. The table organizes the history of the channels in categories such as: current ISU assigned to the channel, start of monitoring, end of monitoring, total error, errors in last day, in last week and in last 30 days, number of seconds since last error, severe errors in last day, in last week and in last 30 days, and current service type, such as ISDN, assigned to the channel.

As indicated in Figure 41, after the parity interrupt is disabled and no active alarm exists, the parity counts are updated 5006 and the timer event is enabled 5008. The timer event (Figure 42), as indicated above, includes a one second loop where the errors are monitored. As shown in Figure 42, if the one second loop has not elapsed 5110, the error counts are continued to be updated 5104. When the second has elapsed 5106, the errors are summarized 5120. If the summarized errors over the one second period exceed an allowed amount indicating that an allocated channel is corrupted or bad 5121, as described below, channel allocator 304 is notified 5123 and ISU transmission is reallocated to a different channel. As shown in Figure 43, when the reallocation has been completed 5200, the interrupt priority is lowered below parity 5210 so that channel monitoring continues and the channel quality database is updated 5215 concerning the actions taken. The reallocation task may be accomplished as a separate task from the error timer task or performed in conjunction with that task. For example, the reallocator 304 may be part of channel monitor 296.

As shown in Figure 44 in an alternate embodiment of the error timer task 5110-2 of Figure 42, channels can be determined to be bad 5304 before the one second has elapsed. This allows the channels that are determined to be corrupted during the initial portion of a one second interval to be quickly identified and reallocated 5308 without waiting for the entire one second to elapse.

Instead of reallocation, the power level for transmission by the ISU may be increased to overcome the ingress on the channel. However, if the power level is

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one channel is increased, the power level of at least one other channel must be decreased as the overall power level must be kept substantially constant. If all channels are determined bad 5306, the fault isolator 302 is notified 5320 indicating the probability that a critical failure is present, such as a fiber break. If the summarized errors over the one second period do not exceed an allowed amount indicating that the allocated channel is not corrupted, the interrupt priority is lowered below parity 5210 and the error timer event is disabled 5332. Such event is then ended 5350 and the channels once again are monitored for parity errors per Figure 41.--

At page 129, please replace lines 8 – 18 with the following:

E5

-- The following is a description of the long integration operation performed by the background monitor routine (Figure 45) of the channel monitor 296. The background monitor routine is used to ensure quality integrity for channels requiring greater quality than the short integration 10^{-3} bit error rate. As the flow diagram shows in Figure 45, the background monitor routine operates over a specified time for each service type, updates the channel quality database 6006 table 300, clears the background count 6008, determines if the integrated errors exceed the allowable limits determined for each service type 6010, and notifies the channel allocator 304 of bad channels as needed 6012.

In operation, on one second intervals, the background monitor updates the channel quality database 6006 table. Updating the channel quality data table has two--

At pages 130-131, please replace the paragraphs beginning on page 130, line 20 – page 131, line 6, with the following:

E6

--Unallocated or unused channels, but initialized and activated, whether used for reallocation for non-concentration services such as TR-8 or used for allocation or reallocation for concentration services such as TR-303, must also be monitored to insure that they are not bad, thereby reducing the chance that a bad channel will be allocated or reallocated to an ISU 100. To monitor unallocated channels, channel monitor 296 uses a backup manager routine (Figure 46) to set up unallocated channels in a loop in order to accumulate error data used to make allocation or re-allocation decisions. When an unallocated channel experiences errors 6110, it will not be allocated to an ISU 100 for one hour 6118. After the channel has remained idle (unallocated) for one hour, the channel monitor places the channel in a loop back mode 6120 to see if the channel has improved. In loop back mode, the CXMU 56 commands an initialized and activated ISU 100 to transmit a message on the channel long enough to perform short or long integration on the parity errors as appropriate. In the loop back mode, it can be determined whether the previously corrupted channel has improved over time and the channel quality database is updated accordingly. When not in the loop back mode, such channels can be powered down. As described above, the

E6

channel quality database includes information to allow a reallocation or allocation to be made in such a manner that the channel used for allocation or reallocation is not corrupted. In addition, the information of the channel quality database can be utilized to rank the unallocated channels as for quality such that they can be allocated effectively. For example, a channel may be good enough for POTS and not good enough for ISDN. Another additional channel may be good enough for both. The additional channel may be held for ISDN transmission and not used for POTS. In addition, a particular standby channel of very good quality may be set aside such that when ingress is considerably high, one channel is always available to be switched to. --

In response to the Examiner's objection to Figures 68 and 69, Applicant amends the specification to tie the Figures to the specification as follows:

At page 199, please replace the paragraph beginning on line 6 and ending on line 22 with the following:

E7

--Figure 68 is a flow chart that illustrates a method for monitoring payload channels by channel manager 900. Channel manager 900 reads parity error registers 901 of the CXMU 56 are read every 10 milliseconds. Generally, the error counts are used to update the channel quality database and determine which (if any) channels require reallocation. The database of channel manager 900 contains an ongoing record of each channel 903. An accumulator sums the errors 905 with previously recorded errors to update the database. The database organizes the history of the channels in categories such as: current ISU assigned to the channel, start of monitoring, end of monitoring, total error, errors in last day, in last week, number of seconds since last error, severe errors in last day, in last week, and current service type, such as ISDN, assigned to the channel. When the channel is a regular (non-loop back) payload channel 907, channel manager 900 determines whether the performance statistics in the database are within service specific threshold 909. When the statistics unacceptably exceed the threshold 910, channel manager 900 reallocates the channel 911 using a "make before break" procedure to reduce the disruption from reallocating the channel. Thus, channel manager 900 allocates the new payload channel for the connection before deallocating the current payload channel.--

At pages 203-204, please replace the paragraph beginning on page 203, line 22 and ending on page 204, line 4 with the following:

E8

--Figure 69 is a flow chart that illustrates an embodiment of a method for allocating a payload channel to the ISU data link. At block 330a, channel manager 900 receives a request for an IDL channel. At block 332a, channel manager 900 determines whether a payload channel is available. If a payload channel is available, channel manager 900 allocates the payload channel to the IDL channel 335 and the data is transmitted to the identified ISU. If, however, a channel is not available, channel manager determines whether one of the allocated channels is

E8
idle by checking the hook state of a line of a channel unit 342. If the line is on hook 339, then channel manager 900 reallocates the channel to the IDL channel 343 until the IDL transmission is complete. If however, channel manager receives a request for a communication link to the line of the channel unit, channel manager interrupts the IDL channel and reallocates the payload channel to the channel unit.-

In response to the Examiner's objection to Figures 61 and 62, Applicant amends the specification to tie the Figures to the specification as follows:

Please replace the paragraphs beginning on page 194, line 9 and ending on page 194, line 25 with the following:

E9
--In each case in which an ISU is assigned to a subband, channel manager 900 uses various criteria to select the subband for an ISU. Figure 62 is a flow chart that illustrates one embodiment of a method for assigning an ISU to a subband. According to this method, channel manager 900 first selects a subband 6202. Channel manager 900 then determines whether addition of the ISU to the subband would provide an acceptable load on the IOC channel 6204. For example, channel manager considers the number of ISUs assigned to a subband. Further, channel manager considers the type of ISU and the likely load that the ISU will place on the IOC channel. By considering these factors, channel manager 900 can selectively distribute the load on the IOC channels so as to facilitate timely communication of control data to and from the ISU. This also allows channel manager 900 to evenly distribute the ISUs over the available subbands such that a like number of ISUs occupy each subband. Channel manager 900 also weighs the number of available channels 6206 within the subband and their transmission quality 6208 as recorded in the tables of channel manager 900. Channels with longer low-error rate histories will be used first. Channels previously marked bad and reallocated for monitoring will be used last. Based on these criteria, channel manager selects a subband for each ISU 6210--

Please replace the paragraphs beginning on page 196, line 1 and ending on page 196, line 17 with the following:

E10
-- likelihood of achieving a connection with acceptable quality levels. For example, channel manager 900 can use the method shown in Figure 61. According to this method, channel manager 900 begins the selection process 6100 by identifying available payload channels 6102 that are located toward the center of the 6 MHz transmission channel. Typically, channels that are nearer to the edge of the 6 MHz channel exhibit higher bit error rates than the channels that are closer to the center. Further, channel manager 900 can also consider limitations of the ISU and the requested service in selecting a payload channel. For example, the ISU may be preset for use only with odd or even payload channels. This information may be included in a ROM on the ISU and provided to the channel

E10
manager when channel allocation is requested or during acquisition. Further, channel manager 900 uses data on the quality of transmissions over the identified channels stored in tables in channel manager 900 to determine which available payload channels have an acceptable error history 6104, e.g., bit error rate. Other appropriate criteria can be used in channel selection that also tend to increase the chances of producing a connection with acceptable quality 6104. Based on these criteria, channel manager selects a payload channel to allocate to the ISU 6106. –

In addition to the above, with respect to the rejection of Claim 27, Figure 124 has been added and the specification has been amended to tie the drawing to the specification.

At page 127, please replace the paragraph beginning on line 4 and ending on line 11 with the following:

E11
--The bit error rate (BER) used as a basis for determining when to reallocate a channel has been chosen as 10^{-3} . Therefore, the acceptable number of parity errors in a one second interval that do not exceed 10^{-3} must be determined. To establish the acceptable parity errors, the probable number of frame errors represented by each observed (monitored) parity error must be predicted. Given the number of monitored parity errors, the probable number of frame errors per monitored parity error, and the number of bit errors represented by a frame (parity) error, a probable bit error rate can be derived. 1242 --
